Grade 12 Chemistry September 2012 exam

Section A

Question 1

1.1 C_nH_{2n-2}

1.2 dehydration

1.3 Le Chatelier's (principle)

1.4 Electrolytic (cell)

1.5 catalyst

Question 2

2.1 B

2.2 A

2.3 C

2.4 D

2.5 C

2.6 D

2.7 B

2.8 C

2.9 C

2.10 B

Question 3

3.1 Cracking✓✓ (2)

3.2 Boiling point✓ (1)

3.3.1 Close to the city- close to the point of sale OR close to people working on the refinery. ✓
Close to habour – cheap and easy transport costs to get oil to refinery. ✓ (2)

3.3.2 The refinery releases polluted gases into atmosphere that cause respiratory problems for residents as they live close to the refinery. ✓✓ (2)

OR

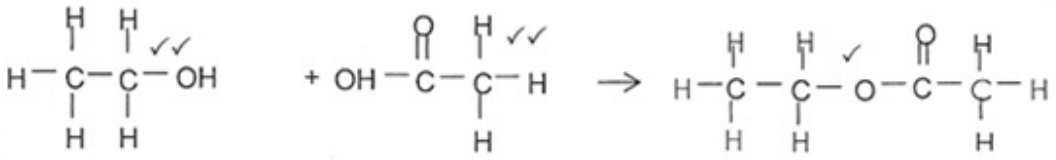
SO_2 gas that is released dissolves in the rain causing acid rain which damages the plants.

[7]

Question 4

4.1 ethanol, ethanoic acid, sulphuric acid} ✓✓ (2)

4.2



(5)

4.3
- act as a catalyst
- dehydrating agent

} Any one. (1)

Question 5

5.1 As the chain length increases, there are more opportunities for van der Waals forces to act between the molecules. ✓ Therefore more heat energy will be required to break apart the molecules. ✓ (2)

5.2 Gas ✓ (1)

5.3 Propan-1-ol has an –OH group in it. This enables hydrogen bonding ✓to occur between molecules which is stronger than van der Waals forces. ✓ (2)

5.4 Viscosity is the 'thickness' of a liquid/ a measure of how easily it flows. ✓ (1)

5.5 Propan-1,2,3-triol ✓has highest BP so must have strongest intermolecular bonding ✓ (2)

5.6 Propan-1-ol ✓ and Butan-1-ol✓ (2)

5.7 A primary alcohol is the one in which the carbon having the –OH group is bonded to only one other carbon atom. ✓✓ (2)
[12]

Question 6

6.1.1 P: halo alkane✓

6.1.2 Q: alkene✓

6.1.3 R: alcohol (alkanol) ✓ (3)

6.2 Unsaturated✓there is at least one double bond between two carbon atoms. ✓✓ (3)

6.3 reactions I✓ and II✓ (2)

6.4 H_2O (water) ✓ (1)

6.5 Combustion✓ reaction (1)

6.6.1 Ethyl propanoate✓✓ (2)

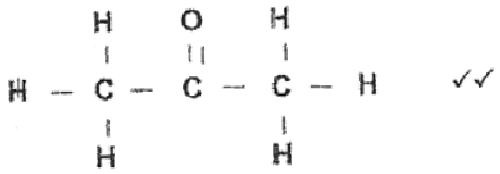
6.6.2 Ethanol✓
Propanoic acid✓ (2)

6.6.3 H_2O (water) ✓ (1)

6.6.4 Elimination✓ (1)

6.7 Organic compounds with the same molecular formula but different structural formula✓✓ (2)

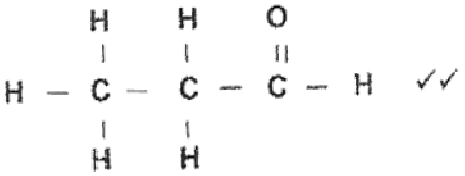
6.7.2 Ketone



✓✓

Propanone ✓

aldehyde



✓✓

Propanal ✓

Question 7

7.1

7.1.1 increase✓

7.1.2 decrease✓

7.1.3 decrease✓ (3)

7.2.1 $2SO_2 + O_2 \rightarrow 2SO_3$ ✓ (1)

7.2.2 After 4 minutes ✓ (1)

7.2.3 Decrease✓ in temperature causes forward reaction to drop more than reverse reaction therefore reverse reaction is favoured therefore reverse reaction must✓ produce heat (be exothermic) (Le Chatelier) so forward reaction must be endothermic ✓ (3)

7.2.4 New equilibrium ✓ (1)

7.3.1 People who read different languages / cannot read can understand what the sign means. ✓ (1)

7.3.2 Acids are corrosive. ✓ (1)

[11]

QUESTION 8

8.1

8.1.1 Concentration of N_2 increased✓ (more N_2 added) (1)

8.1.2 Pressure increased. ✓ (1)

8.1.3 Temperature increased. ✓ (1)

8.2 t_1✓ and t_2✓ (2)

8.3

Equation	**1**N_2	**3**H_2	**2**NH_3
Initial number of moles	5	5	0
Number of moles used/formed	0,6✓	1,8✓	1,2
Number of moles at equilibrium	4,4	3,2	1,2
Equilibrium concentration	0,88	0,64	0,24}✓

n = m/M
n = 20, 4/17✓
n = 1, 2✓ or give two marks in the table for 1,2 mol.

$$K_c = \frac{[NH_3]^2}{[N_2]\ [H_2]^3}$$✓

$$= \frac{(0,24)^2}{(0,88)\ (0,64)^3}$$ ✓

= 0, 25✓ (8)

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Question 9

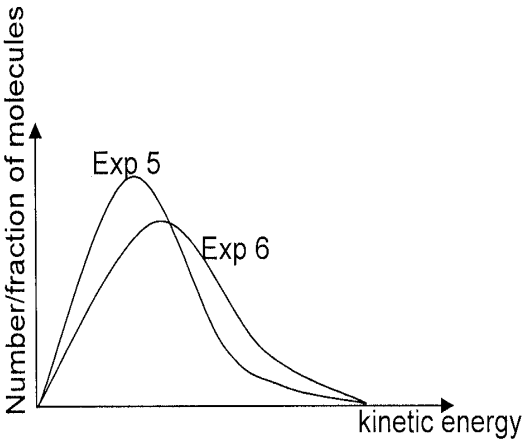
9.1.1 State of division / surface area ✓ (1)

9.1.2 How will the state of division / surface area influence the rate of reaction? ✓✓ (2)

9.1.3 There will be a greater surface area/state of division. ✓✓ (2)

9.2.1 Lower than ✓ (1)

9.2.2



Criteria for graph	**Mark**
Correct shape for both graphs	✓
Graph of experiment 3 reaches a higher maximum/peak value than experiment 4	✓
Graph of experiment 4 shows more molecules of higher kinetic energy	✓

9.3

9.3.1 Endothermic ✓

Reactants at lower energy than products / $\Delta H > 0$ ✓✓ (3)

9.3.2 (a) A – C ✓

(b) B – C ✓ (2)

[14]

Question 10

10.1.1 It is a galvanic✓ cell because chemical energy is converted into electrical✓ energy. When the chemical reaction occurs electrons move in the external circuit from the anode to the cathode. There is a voltmeter reading but no cell or battery is present. ✓ (3)

10.1.2 $Ag^+ + e^- \rightarrow Ag$ ✓ ✓ (2)

10.1.3 $Zn \rightarrow Zn^{2+} + 2e^-$ ✓ ✓ (2)

10.1.4 $Zn + 2Ag^+$✓ $\rightarrow Zn^{2+} + 2Ag$ ✓ (2)

10.1.5 $E^{\ominus}_{cell} = E^{\ominus}_{cathode} - E^{\ominus}_{anode}$ ✓
$= 0,80$ ✓ $- (-0,76)$
$= 1,56V$ ✓ (4)

10.1.6 Zn/Zn^{2+}✓ // ✓ Ag^+/Ag✓ (3)

10.2.1 No, ✓ (1)

10.2.2 Zn electrode will ✓ dissolve as electrons leaving its electrode and the zinc electrode is losing mass. Silver metal is not being lost because the silver ions in solution are receiving electrons and silver metal is formed. ✓ (2)

10.3 The salt bridge provides a passage (path) for the flow of ions in order to maintain electrical neutrality of the solutions. ✓ ✓ (2)
(21)

Question 11

11.1

11.1.1 Cu is not a strong✓ reducing agent to reduce H_2SO_4✓ (2)

11.1.2 $E^{\theta}_{cell} = E^{\theta}_{oxidising\ agent} - E^{\theta}_{reducing\ agent}$✓
$E^{\theta}_{cell} = 0,17$✓ $- 0,34$✓
$E^{\theta}_{cell} = -0,17V$✓ (4)
(6)

11.2.1 * To prevent corrosion✓
* To obtain attractive finish✓
* To purify metals
(Accept any two valid answers) (2)

11.2.2 Cr^{3+}✓✓ (2)

11.2.3 A layer of chromium will be deposited onto it.✓✓ (2)

11.2.4 Reduction✓ of Cr^{3+} must take✓ place at the negative electrode to form chromium ions.✓ (3)
(9)